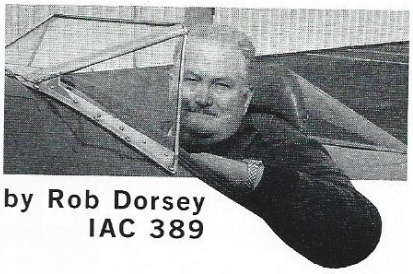
Stick & Rudder

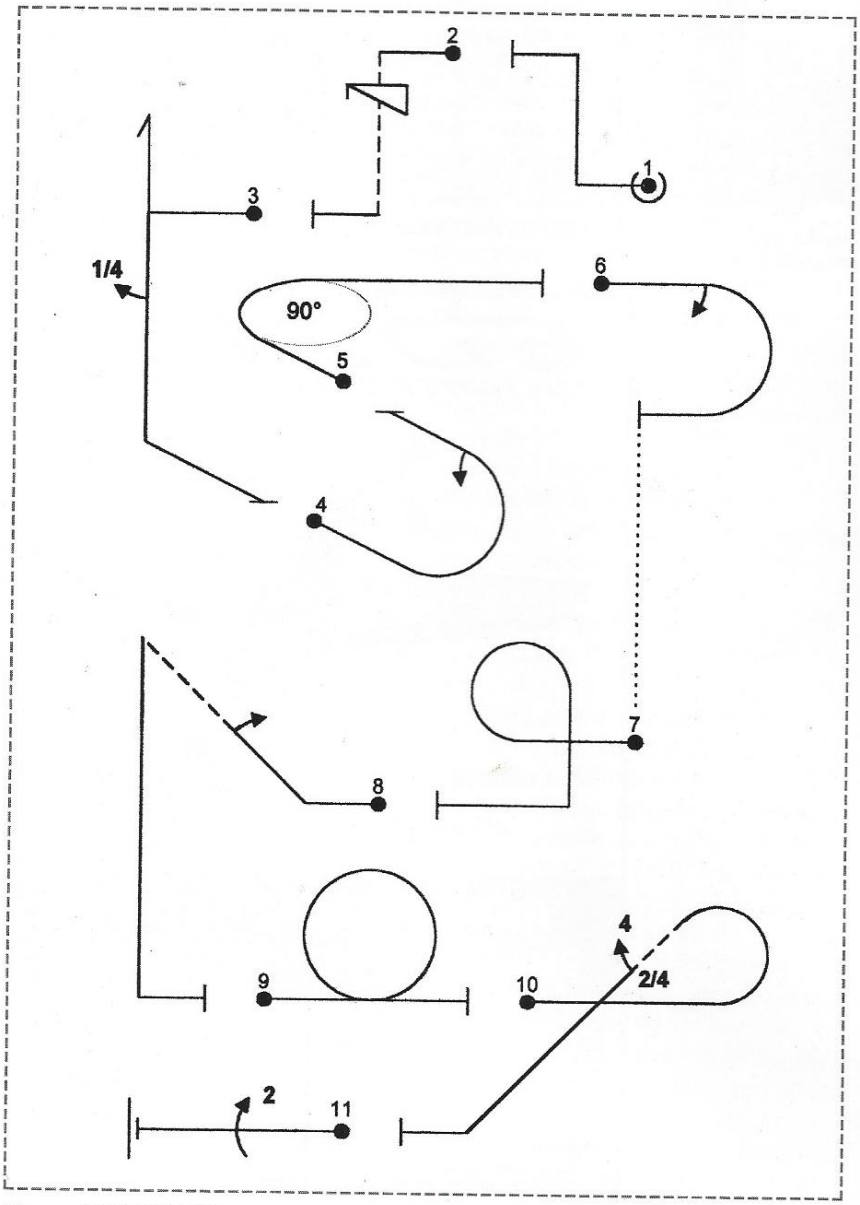


by Rob Dorsey
IAC 389

Through the Sequence

The 2001 Sportsman Known

Again we will take up a figure by figure look at a Known sequence. This time, however, we will look at the Sportsman Known for 2001. It is meant to be winnable by the benchmark Clipped Cub—and is, if you think it through and don't try to fly too hard.



Designing a good Sportsman Known sequence is no easier than creating an Unlimited one. In fact, due to the need to consider the stringent confines of "flyability" for low performance aerobatic airplanes, it might even be more difficult. I had a chance to learn that first hand this past fall when I got myself involved, purely by accident, with the design of this year's Sportsman Known. In the process, I and several of the IAC Board found out just how different the views of flyability could be and how the mechanics of "category drift" actually work. The fact is, "drift" is not accidental but the sum of a tug-of-war between a quartet of agendas. Fear not, nothing even slightly sinister or surreptitious is at work here, just the well meaning handiwork of highly gifted and experienced volunteers with a slight difference of opinion.

One position dictates that the sequence must be designed to satisfy the long time Sportsman pilot who is becoming bored with the usual stuff and wants more challenge. Another says that, since most Sportsman pilots are flying higher performance airplanes (Pitts, Lasers, some Extras, and Sukhois) with only a few Citabrias and Clipped Cubs showing up, then the sequence can be designed for higher power and performance. The third argues that

we must constantly be raising the bar in order to advance the sport. And lastly, the fourth stands pat with the idea that the original concept for Sportsman as being flyable and winnable by a Citabria or Clipped Cub is still perfectly sound and that we must always respect the needs of the entry level pilot and design for them, not the veteran. That is, we must respect those needs if we ever want anyone to even consider starting in this sport. This last position implies, "If you want more challenge pal, move up." Unless you haven't guessed, I am solidly in the latter camp.

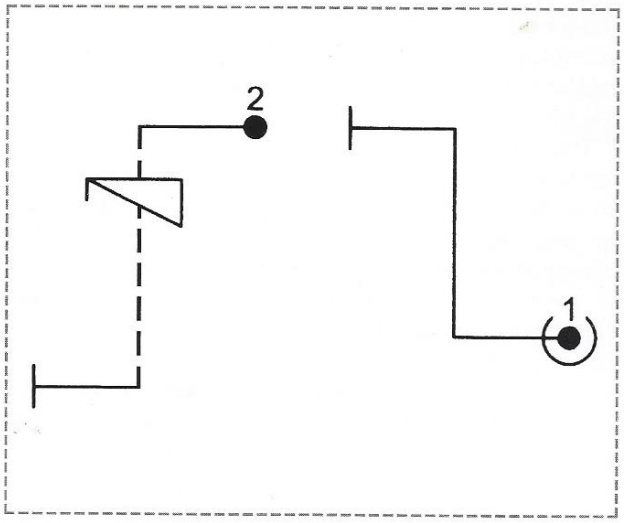
So, there I was, an invited guest at the November 2000 IAC Board meeting and Brian Howard, IAC Rules Committee chairman, is presenting the 2001 Knowns. Now, Brian Howard is as dedicated, smart and sage a pilot, judge and committee chair as you will find and he fills the shoes of rules guru impeccably. However, the present system depends on Known sequences being submitted by the membership and in the whole of 2000, not one Sportsman sequence was sent in, I mean none, zero, zip! So Brian had, amongst his myriad other chores, put forth a sequence for the board to consider. The product was elegant, challenging and probably fun. Trouble is, some of the board members and I thought that it was too challenging and so the proposed sequence was tabled for further study which meant that a process of negotiation began which resulted in the current sequence. Brian, as is his manner, juggled the wants of the many and came up with changes that satisfied all sides of the question. It was a masterpiece of compromise. Now we have to fly it.

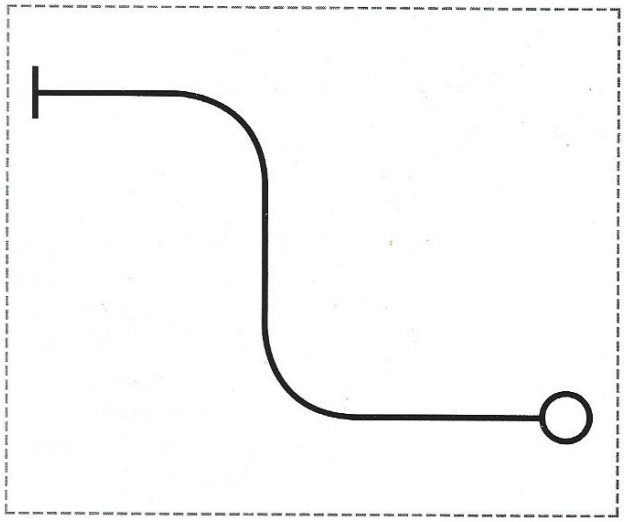
Well, okay, perhaps there is no way for you to keep from tightening up the corner a little but do not, under any circumstances, try to square the corners.

For continuity I'm going to use our four aileron 450 Stearman since it pretty well fills the bill as a model of the low performance genre. I can get it through this sequence without a break and without starting at 5,000 feet (even though I'm convinced that I could get away with it. I mean, it's a big airplane.) The first figure, the vertical line, satisfies the need for presenting a figure which may be new to the entry level pilot, therefore increasing their experience while managing the starting energy to set up for the spin that follows. In the Stearman, I will use all of the speed that I can get, say 165 mph or so with a dive which starts above the box and carries on down to about 2,500 feet. The Cub or Citabria will need to watch V_{ne} so less of a dive is probably called for.

Placement is the name of this game so think about the wind and where this figure should be. With little or no wind drift it will fit just inside the box as you enter into the wind. Ideally it would be 1/4 of the way into the box with the spin centered and the hammerhead at the 3/4 point. Please remember that you should not even think of trying to fly the figure as drawn. It will be more like the accompanying drawing and each "corner" is a quarter of a loop—a normal loop with normal looping G. Well, okay, perhaps there is no way for you to keep from tightening up the corner a little but do not, under any circumstances, try to square the corners. You will be fast, near V_{ne} in some types, and the object is to carry your energy to the top of the line, making the line as long as possible. Excess G will only scrub off speed and energy. Remember the rule, if you experience buffet in the pull-up, ease off, you are exceeding the best lift/drag angle of attack and you've thrown out the aerodynamic anchor.

Figures 1 & 2



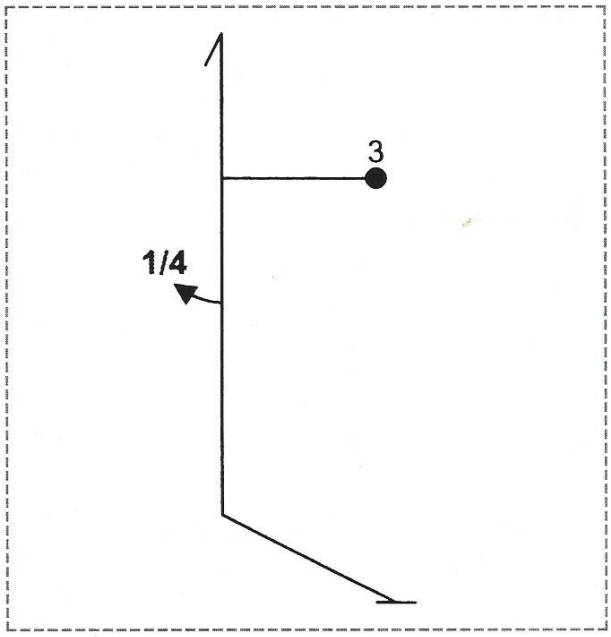


Another mistake in this seemingly simple figure is to pinch the top. Now, if you are doing this in a Clipped Cub, there's no way out, the top will be at a very slow speed and, given any wind, will look like you just stopped and rotated to level. Since that's the fact of it, don't try to carry too much speed through the push-over and in so doing give up altitude. In the Stearman I'll start that push-over at about 80 mph or so and take what I can get. Most importantly I don't want to stall or settle obviously. Make the push-over gentle and easy and keep the wings level at all costs. A bobble in roll is very obvious here so balance the airplane with rudder to keep it absolutely level. Don't try to accelerate too much or you will have to float along killing speed for the spin to follow. Look over the side (Stearman) or through the floor window if you are so lucky and try to enter the spin dead center in the box. Look back to the June 2000 *Sport Aerobatics* and read "The Ins and Outs" in my Stick & Rudder column. It gives a description of how to enter and exit the competition spin that may be worth reading. The spin itself in this sequence is a dirt-plain one turner which doesn't allow the airplane to develop much of a spin at all. It is flown as a precision maneuver and attitude control after the rotation stops is critical. However you do it (I personally use the method I describe in "The Ins and Outs"), you simply must get the airplane vertical down after the spin for a count of "one-and" before pulling out. Also, get the power on as soon as you can after rotation stops. I cannot overemphasize this point. Believe me, you will need the energy.

This is one of the most difficult things for a novice to grasp but, especially in lower performance airplanes, you just must keep the power on unless you are landing or spinning, period.

Figure 3

So, we've done our spin, poured the coal on while still vertical down and we are back down at about the altitude and speed we had when we pulled up into the vertical line. The next figure is one of my favorites but can be an altitude loser if you don't manage it correctly. Assuming that you got the power full on the instant you stopped your spin you should have up a pretty hefty head of steam. I expect to see 130 to 140 mph here in the Stearman and I am running along at full power as I position for the hammerhead. Again, don't rush or yank the pull-up. Like all corners it is a 1/4 looping segment and should generate only slightly more G than a garden variety loop. I expect to see about 3.5 to 4 Gs on the hammer pull-up and no buffet. Set the vertical line with the intent of gaining as much altitude as possible before the hammerhead. As you turn around you must resist the urge to close the throttle, even though you know that you must do a 1/4 roll on the way down. This is one of the most difficult things for a novice to grasp but, especially in lower performance airplanes, you just must keep the power on unless you are landing or spinning, period. I love getting the most out of airplanes like my Stearman, the wonderful old Stampe or a Cub. My old daddy used to say, "Enjoy the advantage of a disadvantage. You'll learn more." And so it is with airplanes. Take pride in looking good in your Citabria and know that, when you are outscored by a guy in an Extra, you are certain that you earned every point you got.



The timing of the downward roll is mostly a matter of feel. While the more anal amongst us may consult the sight gauge to set the down line, I just point the nose at the ground and let the coaching do the rest. The roll itself, ah now there's another matter. We will all tend to use full aileron. I mean, after all, the airplane is pointed bloody straight down id'nit!

Well, think again. If you train yourself to mechanically use full aileron from the git-go the roll rate is bound to vary as the speed changes. Neil Williams used to roll the Stampe vertically using varying aileron deflections to make the roll rate absolutely uniform. While this is only a quarter roll, thinking about this effect and at least trying to implement it will make you a better pilot and planner for the future. And, speaking of planning, which way are you going to roll?

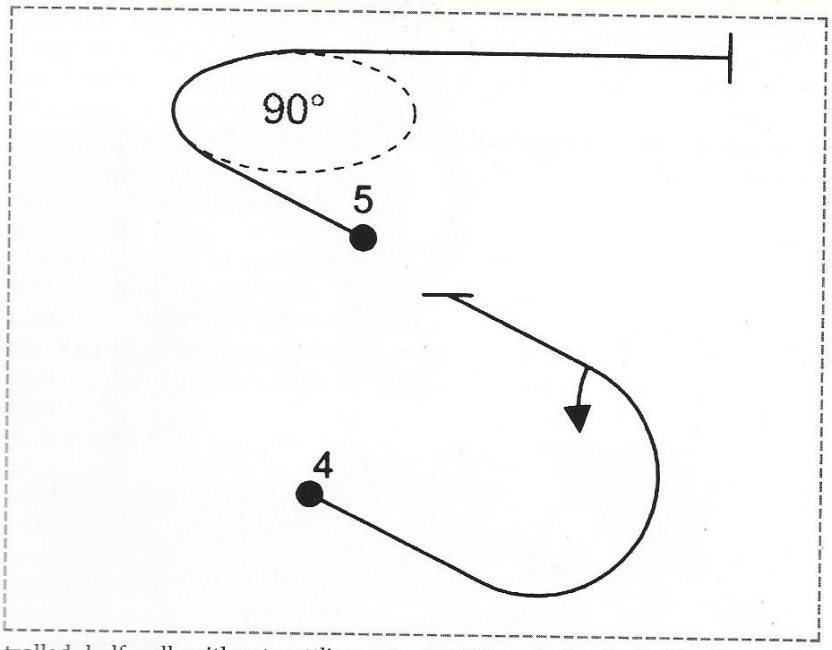
This little couplet, the hammer with a quarter roll down and Immelman, followed by the ninety degree turn is quite interesting because there are a couple of ways you can play it. If you spin with the wind on your left, then the roll will be right if you want to come out into the wind and left to go down wind. You can roll into the wind, fly up to the edge before pulling into the Immelman and then turn early to position upwind or you can roll to exit down wind, Immelman immediately and then motor into the wind before turning. The flexibility is wonderful and lends an intellectual finesse to the sequence that is unusual. When you are done with the little quarter roll, don't rush the

pullout as you look at the altimeter, just keep full power unless V_{ne} is near and make a nice smooth pull-out.

Figures 4 & 5

As for that Immelman, you should have plenty of speed but you will be hurtling across the box and this tends to make us rush things. Sometimes we don't remember that the box is just as wide as it is long. Perhaps it's that we are looking at the judges' line or, conversely, that we are looking at the edge of the box that borders on the boonies. Either way, grit your teeth and wait to position the Immelman at the edge of the box. That will give you the maximum wind correction advantage. Also, we want to regain altitude so make the Immelman as "loose" as you can get away with to end at the highest altitude possible. This is where the power of the 450 Stearman comes into play as I can pull up normally, say 4 Gs and then loosen it up at about 60 degrees nose up and just float the nose to inverted. The four ailerons still give enough roll rate to neatly get it over and there is little more than 60 mph on the old clock. However, I am spoiled as my Zlin 50LS would gain a good 800 feet in even the most clumsy of Immelman's.

The turn at the top, after the Immelman, is sublime. Here Brian has given us both a windfall and a dilemma. We are slow so we won't use up much airspace and we don't care if we kill energy because the next figure is a split-S. Still we must do the turn in aerobatic fashion and, if we are too slow we could stall. Additionally, although the split-S (half roll and half downward loop—Figure 6) is made to start with low energy, you have to be able to neatly roll to inverted before the pull. Be warned, it's a setup. Some might think that after the Immelman they should pull the power and float around the turn so as to enter the split-S really slowly. Nothing will get you a low score on this seemingly simple figure quicker than falling through it. Shoot, that's just what the judges will be looking for. Don't give it to them. Keep enough speed to perform a controlled half roll without settling or falling through and, in my old hog or a Cub that probably means that you will never touch the throttle. It will stay wide open from the end of the spin until the bottom of the split-S. Citabria drivers should have about 90 to 100 mph for the half roll and the Cub no more than 80. In the big biplane I look for 110 if I can get it.



So, with that, let's end this discussion and take up the last half of the sequence next month. It only gets better.